AMENDMENTS

This listing of claims will replace all prior versions, and listings, of claims in the application:

In the claims

Claims 1-10 (cancelled)

Claim 11 (new): A method for extracting fingerprint feature data using a ridge orientation model, comprising:

dividing a digital fingerprint image of a predetermined format into a plurality of regions, each region with a predetermined size;

calculating ridge orientations in the regions;

calculating qualities of ridges according to regions;

separating the fingerprint image into a fingerprint region and a background region according to the calculated ridge qualities;

extracting at least one position of at least one core or delta in the fingerprint region;

determining a candidate position of a core or a delta outside the fingerprint region and a candidate position of each of the at least one core or delta in the fingerprint region from the extracted at least one position of the at least core or delta in the fingerprint region;

setting the determined candidate positions both in and outside the fingerprint region as initial parameters of a ridge orientation model;

setting a quality threshold for fingerprint regions;

calculating parameters of a ridge orientation function by minimizing errors between ridge orientation values of the ridge orientation model and ridge orientation values of fingerprint regions with quality higher than the quality threshold;

calculating ridge orientation values in all regions based on the ridge orientation function; and

deciding at least one final position of the at least one core or delta in the fingerprint region from one or more of the parameters of the ridge orientation function.

Claim 12 (new): The method according to claim 11, wherein

the ridge qualities are calculated from a difference between a gray level difference of ridge orientation with a minimum gray level difference, and a gray level difference of ridge orientation with a maximum gray level difference, and

the fingerprint image is determined as a fingerprint region if both a gray level difference in a longitudinal orientation of ridges and a gray level difference in a lateral orientation of ridges are higher than a gray threshold, and is determined as a background region if both the gray level difference in the longitudinal orientation of ridges and the gray level difference in the lateral orientation of ridges are lower than the gray threshold.

Claim 13 (new): The method according to claim 12, wherein the ridge orientation with the minimum gray level difference is determined to be the longitudinal orientation of the ridges, and the ridge orientation with the maximum gray level difference is determined as the lateral orientation of the ridges.

Claim 14 (new): The method according to claim 11, wherein if a region surrounded by fingerprint regions is calculated to have a ridge quality corresponding to the background region, the region surrounded by fingerprint regions and having quality corresponding to the background region is processed as a fingerprint region.

Claim 15 (new): The method according to claim 11, wherein the at least one position of the at least one core or delta is extracted by calculating a *Poincare* Index with respect to each point within a scope of the fingerprint region.

Claim 16 (new): The method according to claim 15, wherein extracting at least one

position of at least one core or delta in the fingerprint region further comprises expanding the scope and calculating the *Poincare* index with respect to each point within the expanded scope until the at least one position of the at least one core or delta is extracted.

Claim 17 (new): The method according to claim 11, wherein the candidate position of the core or delta located outside the fingerprint region is determined using the following Equation,

$$O_{m'}(z) = \frac{1}{2}\sum_{k=1}^{K} g_k(\arg(z - z_k))$$

where $g_k(\arg(z\text{-}z_k)) = -\frac{\pi}{2} - \arg(z\text{-}z_k)$, z_k for a delta candidate position,

$= \frac{\pi}{2} + \arg(z\text{-}z_k)$, z_k for a core candidate position, and

z is a complex value (x+yi) representing a single arbitrary position in a two-dimensional region, and z_k is a complex value representing the candidate position.

Claim 18 (new): The method according to claim 17, wherein the candidate position is determined by optimizing an error of the following Equation in a region R having a ridge quality higher than a predetermined minimum, using a steepest descent method,

$$< O_e^2 >= \int_R (O(z) - O_{m'}(z))^2 \, dz .$$

Claim 19 (new): The method according to claim 11, wherein the initial ridge orientation model is set by the following Equation,

$$O_m(Z) = O_0 + \frac{1}{2}\sum_{k=1}^{K} g_k(\arg(z - z_k); C_{k,1}, C_{k,2} \ldots, C_{k,l}$$

where $g_k(\theta) = C_{k,l} + \frac{\theta - \theta_l}{2\pi/L}[C_{k,l+1} - C_{k,l}], \quad \theta_1 \le \theta \le \theta_{l+1}$

$$\theta = \arg(z\text{-}z_k); \theta_{k+1}\text{-}\theta_k = \frac{2\pi}{L}; C_{k,l} = g_k(\theta_1)$$

,

$C_{k,l}=-\frac{\pi}{2}-\theta_l$, z_k for a delta candidate position,

$C_{k,l}=\frac{\pi}{2}+\theta_l$, z_k for a core candidate position, and

O_O is "0", z is a complex value (x+yi) representing a single arbitrary position in a two-dimensional region, z_k is a complex value for representing each of the determined candidate positions in turn, K is the total number of cores and deltas, and L is a positive integer.

Claim 20 (new): The method according to claim 11, wherein the ridge orientation function is determined by optimizing an error of the following Equation in each region R with a ridge quality higher than a predetermined minimum, using a steepest descent method,

$$< O_e^2 >= \int_R (O(z) - O_m(Z))^2 dz .$$